except by a safety valve. Water is to be put into the space between the case and the still, after the head and neck is put on; which not sustaining the pressure of the atmosphere will rise beyond the boiling heat, when fire is applied, and boil the liquor in the still, and there being no egress for the steam, but by the safety valve, a small fire will suffice to keep up this degree of heat, and keep the liquor always boiling.

An horizontal flue making some revolutions along the bottom of the case, where it comes in contact with the fire, may pass from thence into the chimney; and a narrow boiler may be placed at the back of the fire place, which may communicate with the case of the still.

When distillation is to be performed aboard a ship, a reservoir of salt water is to be placed upon the deck (through which reservoir the chimney of the fire may pass, and impart its heat) and from thence pipes, having a cock attached to each, may lead into the cases, and stills, for the purpose of their supply. From the necks of the stills, pipes are to be brought conducting the steam into vessels, for cooking provisions, &c.

The range is to have two metal doors in the front, each of which is attached by hinges to iron bolts; which bolts fit into staples affixed to the sides of the range; so that when the fire is not wanted for cooking, it can be entirely closed by these doors; but when required, the doors can be drawn out the length of the bolts, and form a screen between which and the fire, meat, &c. may be roasted. For the purpose of condensation, aboard a ship the tube containing the steam, may pass through the sides of the ship, and along any part of it outside which lies immediately in the water, and again entering the ship, may deposit the water produced by the condensation, into a vessel placed for its reception.

After the sea water has been distilled in this manner, it is to be passed through a filter, of the following construction.

A small cylindrical case, made of tin or other metal, is to be filled with powdered charcoal, each end of which is to be stopped by a circular cover, perforated with holes fine enough to prevent the charcoal from passing through. One end of this case is to be inserted into a cask partly filled with pounded charcoal, and the water being poured into the cask will filter out through the case.

Remarks..The mode of distillation above described, would be very beneficial for other purposes besides that mentioned, particularly for distilling spirituous liquors, as it would entirely prevent the empyreuma (caused by the burning of the ingredients of the distilled liquor at the bottom of the still) which occasions the disagreeable smokey taste, that it is not possible to remove, and which lowers the value of the spirits so much.

The process of filtration recommended for the distilled sea water is very judicious; as it will tend to deprive it of the flat insipid taste, it generally has, both by the operation of the charcoal, and that of the air, which will be mixed with it, in the most effectual manner, as it drops through it in the course of the filtration.

ACCOUNT OF NAUTICAL INVENTIONS OF MR. TREVETHICK.

Continued from p. 215, *No.* XX.

IV. Preparation of Ship Timbers, and improved system of Ship building.

Phil. Mag. v. 34, *p.* 428.

For a long period the only means employed to effect the bending of ship's planks, was by exposing them to the heat of open fires, and in most parts of Europe this is still the practice. As hitherto conducted, it has been found to be a tedious, slovenly process, attended with great expense of fuel, and unequal in its effects, some parts being only partially heated while others are quite burned.

Steam was therefore employed for this purpose; but steam sufficiently hot to destroy the sap, cannot be confined in vessels of any reasonable strength; wood so treated has been found liable to sudden decay; and

when planks beyond a certain thickness, are bent in this way, they are found to be injured from the temperature being too low to give the required flexibility; and owing to the want of a better method, the curving of strong timbers has hitherto been impracticable.

The process recommended (by Mr. Trevithick) instead of the above is to heat the timber and planks, by enveloping them on all sides with hot air and smoke, the coal tar contained in the latter entering into the pores of the wood at the same time. This process is so conducted, as to prevent the wood from being burned by it; all the heated air that reaches the timber, during the operation, being previously made to pass through the fire, and being by that means deprived of its oxygen, or that principle which maintains combustion, no burning can take place.

The means employed to effect the foregoing purpose, consists of horizontal, curvilinear flues, made of cast iron, adapted to the forms intended to be given to the wood, and furnished with a powerful, but simple apparatus, for supplying the force requisite to bend the timbers into the required form.

By this process even timbers of large dimensions can be bent to almost any shape: and they are heated throughout their whole length and substance, without alterations of temperature in the different parts as when exposed to open fires.

By this process the necessity of procuring bent timbers is done away; while at the same time that loss which is incurred by cutting straight or ill shaped timbers into proper forms is avoided, and that weakness which results from cutting across the grain and from scarfing, is obviated.

By this process, there will be a saving of the waste of time, which is necessary in the ordinary process of ship-building, for *seasoning*, as it is called; and, which is of great importance, much of the labour now bestowed on trimming and chipping, to give form both to straight and crooked timbers, will be avoided, while the natural strength of the pieces will be left unimpaired.

The preparation of ship timbers described applies to the system of ship building now in use. But Mr. Trevethick proposes another mode of building in which no ribs or large timbers are required. Strange as it may appear, ribs give but little strength comparatively, and the stability of ships depends chiefly on the planks with which they are covered and lined. The ribs afford little or no strength to each other, and hence arises the facility with which ships break in two, when by any accident the middle is grounded, while the stem and stern are in deep water. The reason is obvious, for in this case there is nothing to bear the strain but the keel, the planks, and the lining.

It might be demonstrated, were it necessary, that if the space now occupied by the ribs, was supplied by a double row of planks, bent into the required curves, placed in the same order as the ribs, and so disposed, that the joinings of each row respectively should be covered by the solid parts of the other, that then a stronger structure would be obtained than results from the present mode of a single row of ribs. In adopting the mode of building just mentioned, straight grained planks of the greatest lengths might be used, and consequently the numerous scarfings and joinings of the present system be entirely done away.

But to obtain the greatest possible strength from the same quantity of materials, the bent planks, employed as substitutes for ribs, should (instead of being placed in the usual direction of the ribs) cross each other at the keel, and consequently up the sides of the ship, at an angle of 50° or 55°, so as to form with each other, at the points of intersection, a kind of lozenge. By this arrangement they would exert their strength in different directions, and the whole would be made to act as a combination of so many diagonal spurs, giving strength and solidity to the structure.

Mr. Trevethick thinks it obvious, that a ship so constructed must be at least twice as strong as one built in the common method: and besides

this, that if it should start an outside plank, it would still be safe, the crossing of the rib-planks preventing the admission of water in such quantity, as to be beyond the power of moderate pumping to keep under; whereas when a ship of the common construction starts a plank, while labouring in a heavy sea, nine times out of ten she founders.

Mr. T. supposes also that the advantages of this plan in point of economy and strength (from the diminished number of joinings, from being enabled to employ straight-grained planks, at all times to be procured with comparative ease, and of considerable lengths) are too manifest to need further proof, and that if it were adopted, there would be no need to send persons abroad to buy timber; our own forests being sufficient to supply us with straight timber for 100 years to come, and at half the expense; during which time more would be growing.

Remarks....If it were even possible to bend straight timber of the size proper for ribs of ships in the manner proposed in this paper, which is much doubted, the fibres at the outside of the curve would be so much divided and broken by the great strain they would receive in the operation, that the strength of the timber must be greatly impaired.

The method proposed of building ships entirely of planks disposed in two or more series, is objectionable on account of the great difficulty of the execution, and from the great expense it would occasion. The operation of bending the planks round the bow of a large vessel, it would seem has not been witnessed by the proposer of the plan, or he would not write so lightly of planking a whole vessel tranversely, which would require as much more labour as the length of the ship exceeds the depth of the bow.

Mr. Trevithick is mistaken as to the facility of procuring timber fit for planks; next to knee pieces, and timber of extraordinary dimensions for great ships, it is the dearest timber used in ships; and it is so far becoming scarce, that it is impossible to get plank of the length that was formerly common; the average of that in use now, not being two-thirds of the length of that, easily procured in times not very remote.

Mr. Trevithick's remarks on the weakness of the present mode of building ships, are however extremely just. Mr. Mackonochie observes (in the prospectus of his work, entitled *A Philosophical and Experimental inquiry into the laws of resistance of non-elastic fluids*) "That it will be received with surprize by those, who have been in the habit of considering a ship as the noblest effort of the human genius, to hear it asserted, that in a mechanical point of view, it is the feeblest, most inartificial, and unworkman-like structure in the whole range of mechanics." But his assertions are accompanied with the most convincing proofs; and it would not be difficult to corroborate them by farther demonstrations.

The method proposed by Mr. Trevithick would certainly be stronger and better than the old mode, but the expense and difficulty of it would render the trial of it unadviseable, and must totally prevent its coming into general use, especially as there is a mode of building ships now known, and proved by the actual construction of a ship on that plan, which has for six years stood all weathers on the Atlantic ocean, without suffering the least injury, and which method unites the greatest strength to cheapness. It is described in our 17th number p. 439. And if builders and seamen could conquer their aversion from improvement, which they too often condemn by the fatal appellation of *innovation*, and would calmly investigate the advantages this method affords, there can be little doubt that it would meet that adoption which it so much merits.

Mr. Trevithick in proposing his ship of plank alone, should have noticed Mr. Wilson's patent for building boats in this method; many made in which mode, are in the king's service, and have been often seen on the Thames. He can therefore have no pretensions to be the origi-

nal inventor of the plan. But though it answers very well for boats, it does not follow that it would do for ships; the difference between the labour of bending three or four inch planks and half inch boards, as well as the cost, is indeed so vastly great, as to show at once the inexpediency of the latter application.

Files and other instruments for various uses, made of stone ware, by G. Cumberland, esq.

Phil. Journal, vol. 25, p.257.

Mr. Cumberland having found the wear of steel files to be very expensive in shaping some substances; it occurred to him, when considering what might be the best remedy, that as stone-ware is so hard as to blunt files, files might be as well made of stone-ware.

The first use he made of this suggestion was, to fold up in muslin, cambrick, and Irish linen, separate pieces of wet clay, forcing them by the pressure of the hand into the interstices of the threads, so as to obtain a correct mould, on divesting them of the covering.

These Mr. Cumberland had well baked, and immediately found he had procured an entire new species of file capable even of destroying steel; and extremely useful in cutting glass, polishing and rasping wood, ivory, and all sorts of metals.

Mr. Cumberland having since reflected, that in glass grinding (the stones for which come from the north and are very expensive) in flatting metallic mirrors, laying mezzotinto grounds, and a number of operations that require unexpensive friction, these stone-ware graters, may ultimately become very useful. Mr. Cumberland thinks this invention the more important, as in all operations of grinding, a great deal of manual labour must first be bestowed on the tool, whereas by this method it may be moulded in an instant, if a press is used as in pipe-making, and the expense is so vastly inferior to that incurred in constructing even the cheapest file.

Mr. Nicholson, in a note on this paper, states, that this ingenious invention promises to be of considerable use in the arts. The abrasion of surfaces is performed, either by a toothed tool as in filing, rasping, &c. or by a grinder in which cutting or hard particles are bedded with considerable firmness in a softer mass; or by scowering, polishing, &c. in which hard particles are more or less slightly retained in a soft or tenacious substance. Mr. Cumberland's instruments appear to promise great utility in the first and last of these processes that is, they may be used either with or without a fretting powder.

On a species of moss proposed as a substitute for wool, &c. in stuffing beds and furniture, by M. Parmentier.

Annales de Chemie v.25, p.175.

The dearness of wool, and more especially the property it has of imbibing putrid miasmata, and propagating contagious disorders, suggested the idea of supplying its place in beds by the *hypnum crispum*, L. a kind of moss of a moderate length, and of a somewhat fragrant smell. Mr. Isengard has sent to the society of Encouragement a specimen of this moss taken from a mattrass, that has been in use for some years, with a paper in which he relates the methods of preparing it for domestic purposes.

This moss may be met with in Italy in every wood, particularly on beech trees; it is gathered in August and September; and is beaten like flocks; it does not form any lumps like them, or retain moisture, is little liable to decay, and costs only the price of the labour, so that four mattrasses made with this moss will cost less than one of wool. It is only necessary to dry it in the shade to preserve its fragrance. No animal moisture produces any fermentation in this moss, as it does in wool; but lest wet should occasion it to germinate, it is recommended to steep it in lime-water, which destroys its power of vegetation.

Remarks....The fact mentioned in the above paper may be of use to the poor in this country; where doubtlessly moss may be procured fit for beds as well as elsewhere. Mr. Parmentier or Mr. Isengard, have not